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UNITED STATES DEPARTMENT OF AGRICULTURE

BUREAU OF ENTOMOLOGY

FOREST INSECT INVESTIGATIONS

HISTORY OF THE MOUNTAIN PINE BEETLE INFESTATION
IN THE
LODGEPOLE PINE STANDS OF MONTANA

D. monticola

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Yellowstone

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Forest Insect Laboratory
Coeur d'Alene, Idaho
July 28, 1934

1934
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1909-1934

INTRODUCTION

This memorandum has been prepared for the purpose of presenting to interested officials a brief history of the destructive mountain pine beetle (Dendroctonus monticolae Hopk.) epidemic, which during the past ¹⁹⁰⁹ twenty-five years has ravaged the lodgepole pine forests of Montana. The information contained in this manuscript will illustrate the seriousness of the destruction which has occurred as well as the extreme difficulty experienced in attempts to prevent this devastation. An effort has been made to eliminate from this paper all tedious details, and it is trusted that in this desire for brevity in a necessarily long narrative essential facts have not been omitted.

Before discussing the rather intricate course of this outbreak, the writer desires to emphasize the relationship which the flight habits of the mountain pine beetle bear to a proper analysis of this situation. Officers of the Bureau of Entomology are satisfied as to the spread of serious outbreaks of this insect in lodgepole pine. This fact has been clearly demonstrated in many instances during the past decade, and flights of fifteen miles or more also appear unquestionable. Inference must not be made that outbreaks of these insects do not develop locally, but when they have developed into serious infestations they continue to spread over tremendous areas. Though the writer believes in the ability of this insect to fly long distances, or at least to be carried by favorable air currents, positive proof

of this position is not available and is difficult to secure. The spread of such infestations can not be foreseen, nor can the distance or direction of such flights be accurately predicted. However, it is fully recognized that blocks of infested trees are a menace to uninfested timber stands, not only immediately adjacent but some distance removed. It is trusted that the reader of this manuscript will associate this question of insect flights to all phases of the situation, as it has a direct bearing upon past and future timber losses as well as the difficulties which have been experienced in the administration of control.

EARLY HISTORY OF THE MONTANA INFESTATION

In 1909 an outbreak of the mountain pine beetle was reported from the white pine and lodgepole pine stands of the Flathead National Forest, approximately 125 miles north of the Big Hole Basin, Beaverhead National Forest. In 1912 control measures were directed against this outbreak, and approximately 26,000 infested trees treated on a relatively small acreage at Swan Lake. It is apparent that this outbreak was far more widespread than assumed by those in charge, and that control measures were confined to heavy centers of infestation only, leaving outlying groups of infested trees to develop into an epidemic which spread southward into the Missoula National Forest. By 1915 this infestation was well distributed throughout the northern portion of the Missoula Forest, and was in a measure officially forgotten, as apparently the life and potential spread of such an

outbreak was not foreseen at that time. At the request of the Forest Supervisor the writer examined the northern portion of the Missoula Forest in May 1921. At that time it was found that the infestation had spread throughout all of the lodgepole pine stands of the Blackfoot River drainage, with extremely heavy centers of infestation at Lincoln and Helmville, Montana, some seventy miles from the Swan Lake project.

Available records also show that another local outbreak of this insect was reported from the Big Hole Basin, Beaverhead National Forest, in the year 1911. During the season of 1912 and 1913, some 25,000 trees were treated, which were distributed in fairly small groups over a rather large acreage. This work was successful, as from that time until 1926 no further losses were recorded. Furthermore, when control measures were instituted within this same area in 1926, in an attempt to check the spreading Bitterroot infestation, which will be discussed later, there were no indications of depredation following the 1913 project.

So in the early history of this infestation we had two local outbreaks--one promptly checked by artificial control and the other allowed to continue in its destruction. And as this history continues it will be seen that the success of the one project was lost through the failure of the other.

MONTE RECENT HISTORY

During the winter of 1924 it became known that there were a number of lodgepole pine trees in the vicinity of Philipsburg, Montana, southern portion of the Missoula National Forest, that had been killed by the mountain pine beetle. This area was only some thirty miles from the heavy centers of infestation at Lincoln and Helmville, Montana, located by the writer in 1921. As valuable timber stands lay directly in the southern path of the 1924 Philipsburg infestation, which was considered as having spread from the infested areas to the north, the situation was considered as justifying the institution of control. Without the advantage of an adequate survey, it was necessary to consider this infestation as constituting the head of the advancing epidemic. The Philipsburg basin, an area devoid of timber, was adopted as a "No Bug's Land," and plans formulated to treat all infested trees to the south of this hoped-for barrier. In the spring of 1924 a few hundred dollars were expended in the treatment of some 1,000 trees distributed throughout this area.

This plan was soon shown to be ineffective, as a survey conducted during the summer of 1924 showed the head of the infestation to be on the East Fork of the Bitterroot River, some few miles further to the south, where heavy centers of attacked trees were recorded.

Late in the winter of 1924 and 1925 a few thousand dollars were made available to combat the heavy infestation on the Bitterroot.

The expenditure of this small appropriation, which permitted the treatment of only 7.725 trees, had no effect in checking the spread of this serious outbreak. A survey of the area in the fall of 1925 showed that the inevitable had occurred, and that the beetles had spread into the treated areas, infesting ten trees where but one had been treated the previous spring. This survey also showed that across the Continental Divide to the south there were several large spots of infested trees on the west side of the Big Hole Basin, where in 1924 only a few scattered red-tops were present.

In the spring of 1926 another effort was made to prevent the infestation on the east fork of the Bitterroot from spreading down the river, by treating all of the infested trees on a much wider zone of defense than covered the previous season. At the same time control measures were instituted in the Big Hole Basin, with the idea that the Continental Divide would at least act as a partial barrier to the continued spread of the Bitterroot infestation into these valuable timber stands.

A more intensive survey conducted during the summer of 1926 demonstrated the fallacy of continuing the effort to check the spread of the infestation down the Bitterroot River, and this part of the project was discontinued. This survey also indicated that there had been a heavy flight of beetles across the Continental Divide, heavily reinfesting the area covered by control the previous spring.

Still hoping that the Big Hole Basin might be held against the influx of beetles from the Bitterroot, the Bureau of Entomology

again recommended the institution of control on the west side of the basin for the spring of 1927. During this operation approximately 18,000 trees were treated at a cost of \$31,500, on practically the same acreage as covered in 1926, when only 5,271 trees were treated. Again the results of the fall survey were discouraging, for not only were the treated areas heavily reinfested, but practically the entire basin area was now found to be infested.

During the 1927 season a new source of danger to the success of the Big Hole Basin project was recognized. With its source a matter of conjecture, an outbreak of the mountain pine beetle in the lodgepole pine stands of the Salmon National Forest reached a serious epidemic stage. As this forest is adjacent to the Beaverhead on the west, this situation placed the future of the project in a more doubtful light than ever before. In fact, there were large blocks of infestation just over the Continental Divide from which insects had undoubtedly already spread into the southern portion of the Big Hole Basin and other units of the Beaverhead.

However, realizing that if the infestation within the Beaverhead were allowed to continue in its southern spread valuable commercial and scenic forests would be destroyed, the Bureau of Entomology again recommended the institution of control in the spring of 1928, though cognizant that the chances of success were rather remote. During this project, which covered a large portion of the Big Hole Basin, some 64,000 trees were treated at a cost of \$89,000, which was the

largest bark-beetle control project ever undertaken. The heavy reinfestation of this large acreage, as well as the occurrence of many newly infested areas, demonstrated the uselessness of attempting to continue this project in its present form. To have continued this project in 1929 would have required an expenditure of at least \$500,000, with the assurance that still larger sums would no doubt be needed for several years or until no further reinfestation of the treated areas occurred.

The recommendation for the cessation of control on the Beaverhead Forest was made after consideration of all factors involved, and in full recognition of the seriousness of the position taken. At that time the Bureau of Entomology proposed another plan which was believed to offer some chance of checking the southern spread of this outbreak. This plan called for the utilization of the wide timberless areas between the Beaverhead and Madison Forests as a potential ^{partial} barrier to the insects. An annual survey was to be made of the Madison Forest, and all infested trees promptly treated.

In 1930 some small spots of infestation were discovered along the western border of the Madison National Forest. At the same time it was discovered that an area of public domain known as the Sheep Creek Hills, which lies between the Beaverhead and Madison Forests, but some twenty miles from the nearest infestation on the Beaverhead, was lightly infested. In the spring of 1931 control measures were instituted in these two areas, and all known infested trees treated.

Once more the effort to check this outbreak appeared futile, for during the summer of 1931 the treated areas were heavily reinfested.

To complete this early history it is now necessary to return to the year 1928, for at that time infestations of the mountain pine beetle were found in the commercially valuable lodgepole pine stands of the Targhee National Forest of Idaho. As the Targhee Forest borders the Yellowstone Park on the southwest, the presence of this infestation constituted a real menace to the scenic forest of the Park. The known infestation (2,752 trees) within the Targhee was treated in the spring of 1928, but a survey conducted that summer showed that the outbreak was far more widespread than had been anticipated, and was also present within the Teton, Caribou, Wyoming, and Cache National Forests. In the spring of 1929 control measures were instituted on these forests, and all infested areas covered by control. The following tabulation shows the number of trees treated:

Targhee	31,204	trees treated on	14,000	acres
Teton	651	"	"	Unknown
Wyoming	6,945	"	"	"
Caribou	386	"	"	"
Cache	7,906	"	"	"

Once more surveys conducted in the fall of 1929 disclosed the fact that marked increases in the infestation had occurred on all of the forests except the Targhee, where the number of infested trees remained about the same except that they were distributed over a much

larger acreage. In the spring of 1930 control measures were again directed against these increased outbreaks, and all infested areas covered by control. The number of trees treated and acreages covered are shown:

Targhee	30,064 trees treated on 67,948 acres
Teton	4,515 " " " 4,000 "
Wyoming	17,160 " " " 60,800 "
Caribou	4,563 " " " 3,240 "
Cache	17,150 " " " 23,000 "

Subsequent surveys of these forests showed that no noticeable results had accrued from the institution of control, as on most areas the infestation showed a marked increase resulting from the 1930 attacks. These surveys also disclosed that a light infestation of this insect was then present in the southwest portion of the Yellowstone Park.

The spring of 1931 again saw the institution of control on all of these forests, with a real effort being made to locate and treat every infested tree. The following tabulation shows the trees treated and acreage covered:

Targhee	35,981 trees treated on 102,870 acres
Teton	4,762 " " " 4,500 "
Wyoming	105,000 " " " 17,055 "
Caribou	15,539 " " " 14,980 "
Cache	9,150 " " " 34,000 "
Yellowstone	2,888 " " " 12,344 "

Following this thorough effort of control all of the forests associated with the project were covered by an adequate survey in the fall of 1931, which once more presented very discouraging data. These data follow:

	Trees Infested 1931	Acres
Beaverhead	12,238,000	622,000
Gallatin	6,557	35,000
Madison	32,000	15,104
Targhee	119,874	438,000
Teton	1,400	4,500
Wyoming	11,993	48,339
Caribou	11,241	24,000
Cache	3,837	84,955
Yellowstone	43,999	117,826
Amount spent for control 1931 --		\$163,761
Amount needed to cover same area in 1932 --		\$650,000

In view of the uncertainty of success as well as the large sum of money which would be needed to continue this project for a number of years, further efforts of control were temporarily discontinued. Though work was discontinued on the Madison, Targhee, Caribou, and Yellowstone, control measures were conducted on the Teton, Wyoming, and Cache National Forests during the 1932 and 1933 seasons. In adopting this drastic position it was understood that all of the forests associated with this project were to be surveyed each year.

and if at any time conditions appeared more favorable the matter was to be brought to the attention of proper authorities.

Before closing this phase of the project history, it would seem that a brief discussion of the infestation on the Targhee, Teton, Wyoming, Caribou, and Cache Forests would be of interest and would serve to more clearly depict the present situation. In considering the infestation on these forests we are at once confronted with the question of its source, which is unknown. Outbreaks of this insect develop locally, and it is possible that the situation on these five forests developed from existing normal or endemic infestations. With our present knowledge of the flight potentials of insects when carried by air currents, an influx of beetles from the heavy centers of infestation to the northwest is perhaps not an impossibility. The fact that these outbreaks occurred as a rather progressive step in the Montana epidemic lends some argument to the flight possibility. The writer has no definite opinion on this matter aside from the fact that no doubt both solutions are possible. However, regardless of the position taken, an explanation must be given to account for the annual reinfestation of the treated areas. Needless to say, the insects come from untreated trees either within or immediately adjacent to the treated units or from areas some distance away. To throw more light on this mooted question, which had a very direct bearing upon the future of the Yellowstone project, the 1931 control operation was instituted

on the basis of a 100 percent clean-up of all infested trees. Through the adoption of such a clean-up policy it was thought by those in charge of the operation that if the treated areas were again heavily reinfested during the summer of 1931 one would of a necessity feel that insects were flying into the areas.

This discussion brings the history of the Yellowstone-Region 4 bark-beetle control project up to the fall of 1931, at which time it was discontinued because of the expense of the operation and the uncertainty of success. But, as stated, the situation was to be held under careful observation, and re-opened for consideration if at any future time control appeared more feasible.

PRESENT SITUATION

In the fall of 1932 insect surveys were again conducted on all of the forests associated with the Yellowstone-Region 4 control project. The data from these surveys were not as discouraging as had perhaps been anticipated. There were marked increases on the Madison, Gallatin, Caribou, and Targhee Forests, with fairly satisfactory reduction in the amount of infestation on the Teton, Wyoming, and Cache, where control measures had been directed against the 1931 infestation. The 1932 infestation on these forests was as follows:

Beaverhead	17,586,000 trees
Madison	19,317 "
Sheep Canyon (Public Domain)	151,000 "
Gallatin	17,393 "
Targhee	170,862 "
Teton	230 "
Wyoming	2,928 "
Caribou	18,756 "
Cache	717 "
Yellowstone	40,590 "
Teton Park	281 "

An analysis of these data placed the project in a more favorable light than existed the previous season, and no irrecoverable loss had followed the cessation of control in the fall of 1931. Though an increase occurred in the Targhee infestation, it was not

abnormal, and was well within the potential increase from the infestation existing on the area. The infestation in the Yellowstone was confined to the whitebark pine stands at high elevations, for which protection was not especially desired. However, the infestation on the Beaverhead and adjacent areas on the Madison continued to increase to alarming proportions, constituting a real menace to the success of control on other areas. As funds had been provided for further control on the Teton, Wyoming, and Cache Forests, the writer believed that the re-institution of control on the Targhee would be justified. This position was based upon the need for the elimination of the rapidly developing centers of infestation on the Targhee, which would soon become, if they had not already, a source of reinfestation to the adjacent forests where control was being conducted. In making this recommendation the writer realized that no assurance of success could be given, but in view of the appalling devastation which lay in the wake of this outbreak it was believed that even a slight chance justified the expenditure. Funds were not available for the adoption of this plan, though control measures were again conducted on the Wyoming and Cache.

During the winter of 1932-33 a distinct "break" occurred in the infestation. Extremely low temperatures in December 1932, and again in February 1933, were followed by a very high mortality in the overwintering broods of the mountain pine beetle. This mortality

varied for different areas, depending of course upon the range of the low temperature. On the Beaverhead Forest the mortality was very heavy, reducing the infestation from 17,566,000 trees in 1932 to 915,000 in 1933. On the Targhee it was estimated that approximately 50% of the overwintering broods were destroyed, which can be assumed to have reduced the 1933 attack by an equal amount.

With this "break" in the infestation as an encouragement, the forests of the Yellowstone project were again covered by an insect survey in the fall of 1933. Data follow:

Beaverhead	915,597
Madison	7,504
Sheep Canyon	14,868
Gallatin	18,956
Targhee	303,188
Teton	585
Wyoming	4,737
Caribou	63,022
CACHE	2,015
Yellowstone	61,005
Teton Park	1,500

Again the analysis of these data seemed to place the Yellowstone project in a still more favorable light. It was apparent that in the northern forests--Beaverhead, Salmon, and those areas adjacent, that were subjected to extreme low temperatures the previous

winter--a much higher brood mortality had occurred than in the more southern forests of the project. Though on the Targhee, Teton, Wyoming, Caribou, and Cache Forests there were no appreciable changes in the status of the infestation as a result of low temperatures, one can correctly assume that the infestation on the Targhee was materially reduced as a result of this abnormal mortality, and it is possible that the same conditions existed to a less degree on the more southern units. Though on several of the forests the 1933 situation was of a more serious character than at the time work was discontinued in 1931, it was evident that the entire project could be viewed in a more favorable light. Work was discontinued in 1931, as it was assumed that for a number of years, no matter how thoroughly the infested units were covered by control, there would be an annual reinfestation from sources outside of the area. The so-called "break" in the infestation had been of value in eliminating or at least reducing these potential sources of reinfestation. The outbreaks on the western portion of the Challis and Salmon Forests of Idaho had subsided to a point where they could no longer be considered as danger points, and the severe winter-kill on the Beaverhead had practically eliminated the source of reinfestation. However, it was realized that sufficient timber still remained on the eastern Beaverhead and the Gallatin Forest to permit the infestation to rebuild to its former seriousness and defeat the success of control.

At this point the writer desires to quote from his report of December 22, 1933, in which the 1933 situation is summarized and recommendations made for control:

"If the present status of the mountain pine beetle infestation in the lodgepole pine stands of the different units of the Yellowstone project is studied, with the memory of the devastation which has occurred on the Beaverhead and central Idaho forests, the seriousness of the situation is more fully appreciated. Since the cessation of control in the spring of 1931, the Targhee infestation has developed to a degree which during the next few years will increase rapidly and unless checked by natural or artificial means will destroy not only the timber stands of the Targhee but adjacent forests as well. Though the economic importance of this situation can be appreciated, it is difficult to evaluate. Commercial timber stands can be appraised, but the scenic values of the forests which are at stake are difficult to weigh. What effect such an epidemic will have upon the timber stands in question is difficult to depict, and reference can only be made to the devastation which has occurred on the Montana and central Idaho forests, where on large areas 75% of all trees of 6" or more in diameter have been killed.

"In studying the entomological aspects of this situation, there are no reasons to assume that success should not follow the institution of artificial control, though of course it can not be

assured, and the following recommendations are based upon the entomological phases of the problem only. Though the present situation has been described in some detail, with a brief attempt at forecasting future depredations, it would seem that the final decision as to the economics of the expenditures recommended should rest upon the agency charged with the responsibility of the timber lands in question.

"In view of the seriousness of the present situation, as well as the rather evident fact that if control is not instituted on the Targhee in the spring of 1934 it will no longer be feasible, it is recommended that the Yellowstone project be re-opened in the spring of 1934. In re-opening this project it is recommended that the infested portion of all units be covered with as thorough a clean-up as possible. The Yellowstone problem is a difficult one to correctly analyze. It is possible that our activities should be directed toward the infestation in lodgepole pine only, with no attention being paid to the outbreak in whitebark pine, though the writer sincerely believes that an interchange of these hosts is inevitable. If this occurs, it would be a simpler operation to cover the rather small areas now infested than the large bodies of lodgepole once a spread has occurred. It is therefore recommended that the most accessible areas and those adjacent to the susceptible lodgepole pine forests be included in this project.

"The following requests for funds have been made by the Forest

Service and Park Service, to which I concur, with the listed reservations:

<u>Unit</u>	<u>Funds Requested</u>	<u>Writer's Comments</u>
Yellowstone	\$125,000	This amount will not be sufficient to cover the areas where control is necessary. Would suggest \$180,000, as the cost of treatment in these remote areas will be at least \$3.00 per tree.
Targhee	\$300,000	Would suggest an additional \$25,000.
Caribou	63,000	Should be sufficient.
Cache	4,000	Should be sufficient.
Wyoming	15,000	Would suggest an additional \$6,000 to treat the adjacent whitebark pine infestation.
Teton	15,000	Would suggest an additional \$5,000 to effect a good clean-up of the newly infested area near the 1931 Gravel Creek fire.

"To this total of \$512,000 which has been estimated as being necessary for the treatment of all the project units, the writer would recommend the allotment of an additional \$91,000. This recommendation does not take into consideration any IMPWIRA funds which have been previously allotted to Region Four. It is recognized that this is a large appropriation, and it is possible that even in the event of the writer's recommendations being accepted sufficient funds will not be available. If any reduction in this allotment is to be made, it is recommended that the work

in the Yellowstone unit be restricted to the lodgepole infestation in the Bechler area, which would necessitate an expenditure of some \$5,000 instead of \$180,000 as estimated, though this is recommended. The reason for this position is that there is a question as to the infestation in the whitebark pine stands spreading into the lodgepole. However, there would seem to be no other possible separation of the remaining units, as the infestation is so closely connected that areas left untreated will seriously affect the results of control on the others, and eventually cost far more for control than the original estimate. A further reduction in the allotment of funds for the institution of control within these forests will prove to be false economy."

Though these recommendations were approved, no action was taken.

The 1934 situation is unknown at this time, but after adequate surveys are made in the fall a report will be submitted.

STATISTICAL HISTORY OF THE MOUNTAIN PINE BEETLE
INFESTATION ON THE FORESTS OF THE YELLOWSTONE-
REGION 4 BARK-BEETLE CONTROL PROJECT

BRAVERHEAD NATIONAL FOREST

Year of attack	Acres infested	Trees per acre	Number infested trees	Remarks
1925	17.920	.294	5.271	Trees treated 1926
1926	18.588	.937	17.418	Trees treated 1927
1927	299.520	.183	55.045	Trees treated 1928
1928	1,341.860	.239	321.372	No control
1929	1,341.860	1.553	2,084,123	" "
1930	1,341.860	2.858	3,835,958	" "
1931	1,341.860	11.478	15,402,520	" "
1932	1,341.860	13.105	17,586,171	" "
1933	1,341.860	.682	915,597	" "

SHEEP CANYON AREA (PUBLIC DOMAIN)

Year of attack	Acres infested	Trees per acre	Number infested trees	Remarks
1930	2,345	1.298	3,045	Treated 1931. Timbered acreage only.
				Not treated. Acreage includes total area surveyed. 4000 acres used to compute trees per acre.
1931	23,680	5.795	23,183	
1932	23,680	37.750	151,000	Ditto
1933	23,680	3.714	14,858	Ditto

MADISON NATIONAL FOREST

Year of attack	: Acres infested	: Infested trees per acre	: Number infested trees	: Remarks
1930	13,889	.203	2,825	Treated 1931. Timbered acreage only.
				Not treated. Acreage includes total area surveyed. 18,000 acres used to compute trees per acre.
1931	45,780	.387	6,975	
1932	45,780	1.073	19,317	Ditto
1933	45,780	.416	7,504	Ditto

GALLATIN NATIONAL FOREST

Year of attack	: Acres infested	: Infested trees per acre	: Number infested trees	: Remarks
1931	62,720	.154	9,676	
1932	114,660	.151	17,383	
1933	141,440	.134	18,956	

TARGHEE NATIONAL FOREST

Year of attack	: Acres infested	: Infested trees per acre	: Number infested trees	: Remarks
1927	5,000	.550	2,752	Treated spring 1928
1928	14,800	2.108	31,205	Treated spring 1929
1929	67,948	.442	30,064	Treated spring 1930
1930	102,870	.349	35,987	3,671 treated fall 1930 32,316 treated spring 1931
1931	480,427	.249	119,874	Not treated
1932	494,587	.345	170,862	" "
1933	464,284	.653	303,188	" "
1934	580,804	.836	485,300	

TETON NATIONAL FOREST

Year of attack	: Acres	: Infested trees	: Number infested trees	: Remarks
1928	:	:	651	Treated spring 1929
1929	4,000	1.128	4,515	Treated spring 1930
1930	4,500	1.058	4,762	Treated spring 1931
1931	4,500	.325	1,461	Treated spring 1932
1932	4,500	.051	230	:
1933	4,500	.130	585	:
1933	9,577	.967	9,263	New area - Adjacent 1931 burn - NE corner forest
1933	565,300	.507	287,000	:

GRAND TETON NATIONAL PARK

Year of attack	: Acres	: Infested trees	: Number infested trees	: Remarks
1931	:	:	283	Treated spring 1932. Jenny's Lake. Light attacks.
1932	:	:	261	Treated spring 1933. W.B.pine. Glacier & Death Canyon areas.
1933	:	:	75	Treated fall 1933. W.B.pine. Glacier, Death Canyon, Cascade areas.
1933	6,000	.35	1,500	Lodgepole pine. Windy Pt area.

WYOMING NATIONAL FOREST

Year	of	attack	infested	per acre	infested	Number	infested	Remarks
	Acres				trees	trees		
Gray's River								
1928						6,945		Treated 1929
1929	60,800		.282			17,160		Treated 1930
1930	106,022		.162			17,277		2,055 treated fall 1930. 15,222 treated spring 1931.
1931	24,680		.134			3,325		Treated fall 1931
1932	10,630		.275			2,928		Treated spring 1931
1933	8,959		.371			3,324		
Green River								
1932	5007		2.156			1,078		Treated fall 1932. Data as to acreage uncertain
1933	1					1,413		Data incomplete

CARIBOU NATIONAL FOREST

Year	of	attack	infested	per acre	infested	Number	infested	Remarks
	Acres				trees	trees		
1928	572		.928			531		Treated spring 1929
1929	3,240		1.335			4,327		1,258 treated fall 1929 3,079 " spring 1930
1930	14,980		.770			11,539		Treated spring 1931
1931	24,000		.468			11,243		Not treated
1932	34,829		.538			18,756		" "
1933	40,090		1.572			63,022		" "

CACHE NATIONAL FOREST

Year of attack	: Acres infested	: Infested trees per acre	: Number infested trees	: Remarks
1928	:	:	7,906	Treated spring 1929
1929	27,415	.625	17,158	2,605 treated fall 1929; 14,553 treated spring 1930.
1930	34,000	.269	9,150	Treated spring 1931
1931	35,458	.164	5,837	586 treated fall 1931; 5,251 treated spring 1932.
1932	17,266	.041	717	Treated fall 1932
1933	14,311	.140	2,347	

YELLOWSTONE NATIONAL PARK

Year of attack	: Acres infested	: Infested trees per acre	: Number infested trees	: Remarks
1930	12,344	.233	2,888	Trees treated spring 1931. Bechler River control unit.
1931	117,826	.373	43,999	General survey of entire park
1932	117,826	.344	40,590	" " " " "
1933	202,113	.301	61,005	

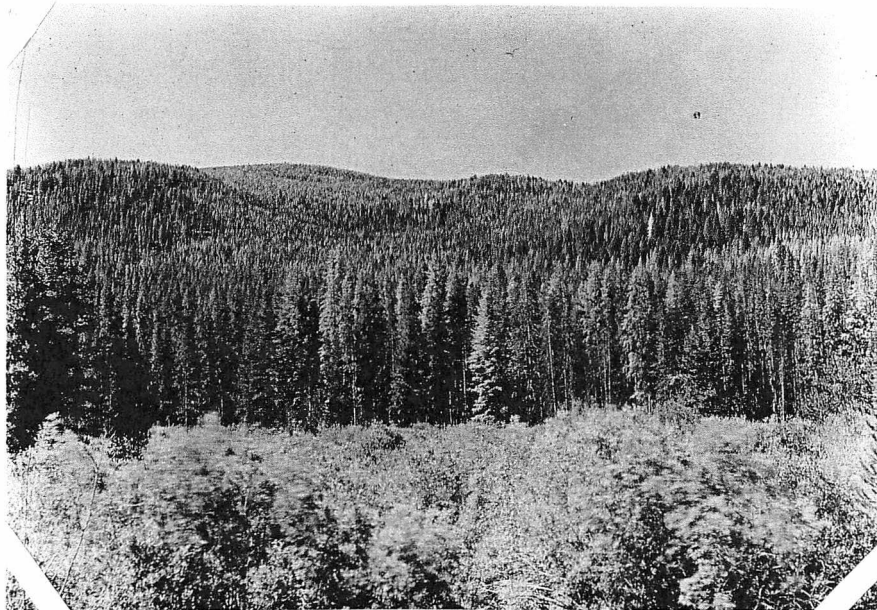
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Photograph No. 1

Heavy center of infestation on the East Fork of the Bitterroot River, showing practically all trees above 6 inches in diameter to have been destroyed by the mountain pine beetle. By the use of panchromatic plates the red foliage of the dying and dead trees appears white. Picture taken August 1924 by H. J. Rust.

Photograph No. 2

Historic Battlefield in the Big Hole Basin. This area marks the scene of an engagement between the Nezperce Indians under command of Chief Joseph and United States forces under Colonel Gibbons. This engagement took place on August 9th, 1877. All of the trees within the historic battle ground are now dead as a result of mountain pine beetle attack. Photograph taken by James C. Evenden in 1933.



NO. 1



NO. 2

Photograph No. 3

Museum, Big Hole Basin Battlefield, containing some of the mementos of the engagement between the Nezperce Indians and United States forces. All trees surrounding this museum are now dead as a result of mountain pine beetle attacks. Photograph taken in 1932 by James C. Evenden.

Photograph No. 4

Trail Creek, Big Hole Basin, showing practically a 100 percent kill of the lodgepole forests as a result of mountain pine attack. Photograph taken by E. E. Miller. In 1928 there was not a dead tree to be seen in this area.



No. 3



No. 4